

WHAT IS CLAIMED IS:

1. A method of depositing a silicon-containing film on a substrate, the method comprising:
 - providing a substrate in a process chamber of a processing system;
 - heating the substrate;
 - exposing a HCD process gas to the substrate; and
 - depositing a silicon-containing film on the substrate.
2. The method according to claim 1, wherein the exposing comprises exposing an inert gas to the substrate.
3. The method according to claim 2, wherein the exposing further comprises flowing a HCD gas at a flow rate between about 5sccm and about 1,000sccm and the inert gas at a flow rate between about 5sccm and about 20,000sccm.
4. The method according to claim 1, wherein the exposing further comprises exposing a hydrogen-containing gas to the substrate.
5. The method according to claim 1, wherein the exposing further comprises exposing H₂ to the substrate.
6. The method according to claim 1, wherein the flowing further comprises flowing a hydrogen-containing gas at a flow rate between about 5sccm and about 5,000sccm..
7. The method according to claim 1, wherein the exposing further comprises exposing a second silicon-containing gas to the substrate.
8. The method according to claim 1, wherein the exposing further comprises exposing at least one of SiH₄, SiCl₄, Si₂H₆, and SiH₂Cl₂ to the substrate.

9. The method according to claim 3, wherein the flowing further comprises flowing a second silicon-containing gas at a flow rate between about 5sccm and about 1,000sccm.

10. The method according to claim 1, wherein the exposing further comprises exposing a hydrogen-containing gas and a second silicon-containing gas to the substrate.

11. The method according to claim 1, wherein the exposing further comprises exposing H_2 and at least one of SiH_4 , $SiCl_4$, Si_2H_6 , and SiH_2Cl_2 to the substrate.

12. The method according to claim 1, wherein the exposing further comprises exposing a HCD gas and at least one of a phosphor-containing gas, a boron-containing gas, and a nitrogen-containing gas to the substrate.

13. The method according to claim 1, wherein the exposing further comprises exposing a HCD gas and at least one of PH_3 , B_2H_6 , BCl_3 , and NH_3 to the substrate.

14. The method according to claim 1, wherein the exposing further comprises exposing a halogen-containing gas to the substrate.

15. The method according to claim 1, wherein the exposing further comprises exposing at least one of HF , F_2 , Cl_2 , and HCl to the substrate.

16. The method according to claim 1, wherein the exposing further comprises exposing a germanium-containing gas to the substrate.

17. The method according to claim 16, wherein the exposing further comprises exposing at least one of a hydrogen-containing gas, a dopant gas, and a halogen-containing gas substrate.

18. The method according to claim 1, wherein the exposing further comprises exposing at least one of GeH_4 and GeCl_4 to the substrate.

19. The method according to claim 1, wherein the exposing further comprises exposing a hydrogen-containing gas and a germanium-containing gas to the substrate.

20. The method according to claim 1, wherein the exposing further comprises exposing H_2 and GeH_4 to the substrate.

21. The method according to claim 1, wherein the depositing comprises selectively depositing an epitaxial silicon-containing film on a silicon substrate.

22. The method according to claim 1, wherein the depositing comprises non-selectively depositing a polycrystalline silicon-containing film or an amorphous silicon-containing film on a substrate.

23. The method according to claim 1, wherein
the exposing comprises exposing a HCD process gas including HCD gas and a germanium-containing gas to the substrate; and
the depositing comprises depositing a SiGe-containing film on the substrate.

24. The method according to claim 23, wherein the depositing comprises selectively depositing a SiGe-containing film on a silicon surface.

25. The method according to claim 23, wherein the depositing comprises depositing a SiGe-containing film having a germanium content below about two atomic percent.

26. The method according to claim 23, wherein the depositing comprises depositing a SiGe-containing film having a germanium content greater than about two atomic percent.

27. The method according to claim 1, wherein the heating comprises heating the substrate to between about 500°C and about 900°C.

28. The method according to claim 1, wherein the heating comprising heating the substrate to between about 700°C and about 900°C.

29. The method according to claim 1, wherein the heating comprises heating the substrate to a temperature of about 800°C and the depositing comprises selectively depositing an epitaxial silicon-containing film on a silicon surface of the substrate.

30. The method according to claim 1, wherein the heating comprises heating the substrate to a temperature of about 700°C and the depositing comprises non-selectively depositing a silicon-containing film on the substrate.

31. The method according to claim 1, further comprising providing a process chamber pressure less than about 100Torr.

32. The method according to claim 1, further comprising providing a process chamber pressure less than about 10Torr.

33. The method according to claim 1, further comprising providing a process chamber pressure of about 0.4Torr.

34. The method according to claim 1, further comprising:
pretreating the substrate prior to exposing a HCD process gas to the substrate.

35. The method according to claim 34, wherein the pretreating comprises exposing a H₂ gas to the substrate at a substrate temperature between about 500°C and about 1000°C.

36. The method according to claim 34, wherein the pretreating comprises exposing a H₂ gas to the substrate at a substrate temperature of about 900°C.

37. A computer readable medium containing program instructions for execution on a processor, which when executed by the processor, cause a processing apparatus to perform the steps in the method recited in claim 1.

38. A system for processing a substrate, comprising:
means for providing a substrate in a process chamber of a processing system;
means for heating the substrate;
means for exposing a HCD process gas to the substrate to deposit a silicon-containing film on the substrate.

39. A processing tool for depositing a silicon-containing film on a substrate comprising:
a processing system;
a transfer system configured to provide the substrate in a process chamber of the processing system;
a heater for heating the substrate;
a gas injection system configured to expose a HCD process gas to the substrate in the processing system; and
a controller configured to control the processing tool.

40. The processing tool according to claim 39, wherein the processing system comprises a batch type processing system or a single wafer processing system.

41. The processing tool according to claim 39, wherein the processing system comprises a batch type processing system containing a process tube.

42. The processing tool according to claim 39, wherein the processing system comprises a thermal processing system, a plasma processing system, or an atomic layer deposition system.

43. The processing tool according to claim 39, further comprising a processing system configured for pretreating the substrate.

44. The processing tool according to claim 39, further comprising a process monitoring system.

45. The processing tool according to claim 39, wherein the gas injection system is configured to expose a HCD process gas comprising HCD and an inert gas and at least one of a hydrogen-containing gas, a silicon-containing gas, and a germanium-containing gas to the substrate.

46. The processing tool according to claim 40, wherein the gas injection system is configured to expose a HCD process gas comprising HCD and an inert gas and at least one of a dopant gas and a halogen-containing gas to the substrate.